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Bridging the gap: Teachers' grasp and execution of technology-enhanced flipped classrooms

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Abstract

This article presents an assessment of the implementation of flipped classrooms and the use of Edpuzzle for this purpose. Four elementary schools engaging in the School Transformation Programme 2025 (TS25) across various subject areas were included in the study. As part of this programme, teachers received training in pedagogical and technological knowledge. A mixed-methods design was employed to collect and analyse both quantitative and qualitative data. The findings indicate that teachers demonstrated a strong understanding of the pupil-centred concept in the flipped classroom model. However, while teachers universally used Edpuzzle for pre-class activities, there is a need for them to fully leverage its features and enhance creativity to develop more engaging video quizzes.

Keywords: *flipped classroom; flipped learning; digital tools; Edpuzzle*

INTRODUCTION

The transformation programme

The School Transformation Programme 2025 (TS25) initiative by the Ministry of Education Malaysia focuses on developing pupils and high-quality schools that align with the current needs of education in Malaysia. Through TS25, teachers are expected to apply best practices in management, leadership, and pedagogy in teaching and facilitation, aligning with the aspirations outlined in the Malaysia Education Development Plan 2013–2025.

The TS25 programme encourages and creates awareness among teachers about the importance of practical pedagogical approaches supported by educational technologies, which use digital tools in the context of the study. The awareness is hoped to make meaningful changes in teachers' teaching and learning practices that pave the way for pupils to experience real-world problem-solving in their learning. In discussing how to achieve the needs of 21st-century skills, Trilling and Fadel (2009) mentioned that pupils need more real-world problem-solving, internships or practices in natural work settings, and other more authentic learning experiences to make learning last and be helpful.

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Continuing Professional Development (CPD) programmes are crucial in familiarising teachers with new knowledge that adds to their existing knowledge (Hoban, 2002). Contemporary pedagogical approaches, such as the flipped classroom approach, can be explored more via CPD. These programmes could highlight the significance of practical pedagogical approaches and educational technologies and promote authentic learning experiences. The fundamental principle of the flipped classroom is to liberate classroom time by disseminating learning materials through videos outside the classroom and teachers can utilise the classroom time to provide authentic learning experiences (Bergmann & Sams, 2014).

The use of videos for flipped classroom

The use of videos is a cornerstone of the flipped classroom model. Video-recorded lectures facilitate pupils' easy comprehension of the material. This approach allows learners to rewind and review challenging parts and speed through those they have already grasped. (Santikarn & Wichadee, 2018; Siegle, 2014). Teachers can supplement their lectures with ready-made videos from video-hosting websites like YouTube. Incorporating these videos into the learning process can make it more enjoyable and meaningful (Kawinkoonlasate, 2019). To engage with pre-class videos, the duration should be kept short (Hadijah & Riau, 2017; Long et al., 2016). The selective use of videos, where appropriate, will provide pupils with a better learning experience than the blanket use of video (Sams & Bergmann, 2013).

Class time for flipped classroom: Platform for pupils to grow

The flipped classroom model brings about a transformative shift in the traditional classroom environment. It turns passive learners into active participants, empowering them to determine the timing, location, and content of their learning. This pupil-centred approach to education offers a hopeful vision for the future of learning, inspiring educators to embrace this innovative model (Siegle, 2014).

Teacher's role in flipped classroom: Guide by the side

The transformation of teachers in flipped classroom settings is that they are no longer a 'sage on the stage' but become more of a 'guide on the side'. Since the focal point of a classroom is the pupils, the teacher in the classroom is to provide expert feedback. One massive benefit of flipping is that struggling pupils get the most help. The role of the teacher in the classroom is to help as well as to guide pupils rather than to deliver information (Bergmann & Sams, 2012; Sams & Bergmann, 2013). To guide and facilitate them appropriately in having flipped classrooms, teachers must figure out the learning materials and make sure that the pupils and even themselves are literate in utilising technology (Anwar & Pratama, 2016; Anwar, 2017).

The significance of this study

Assessing the implementation of flipped classrooms and the use of Edpuzzle as content-delivering tools within the TS25 framework is crucial for several reasons. First, it provides empirical evidence on the effectiveness of these innovative teaching strategies in enhancing pupil engagement and learning outcomes via technology-enhanced pedagogy. Second, it addresses the gap in understanding how digital tools like Edpuzzle can facilitate flipped classroom models, thereby offering scalable solutions for educational improvement.

CPD is needed to create awareness among teachers on how they can align their teaching and learning practices with current educational trends. Educational change is often a linear process that can be supported by a step-by-step approach to teacher learning. The term 'professional development programme' implies 'training' teachers by providing them with prescriptive knowledge in a workshop to add to their existing knowledge base (Hoban,

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2002). CPD is imperative for educators as it provides a platform for them to meet the demand for enhancement in their knowledge base, driven by the notion that their practice should be guided by evidence and research (Forde et al., 2009). As professionals in the field of education, teachers are also obligated to meet this requirement.

METHOD

By utilising mixed-method design, this study was aligned with two guiding questions for inquiry.

Guiding questions

Two inquiry questions served as the basis for this study on first-time adopters' use of flipped classrooms following professional development workshops: 1) To what extent do teachers understand the flipped classroom concept? and 2) How do teachers implement technology-integrated flipped classrooms?

Respondents

A total of 34 teachers (N = 34) from four schools under the School Transformation Programme 2025 (TS25) participated in a school support project called *FlipEd: Holistic School Support.* The project structure included three workshops, two mentoring sessions, and one flipped classroom implementation. After three consecutive workshops, two teachers from each school (N=8) were selected based on specific criteria, including completion of pre-class Edpuzzle videos, teaching subjects, and demonstrated engagement in the workshops, as shown in Table 1 below. These selected teachers collaborated in pairs for the classroom showcase at the programme's end. Efforts were made to ensure a diverse representation of teaching subjects and experience levels, but the sample size remains a limitation for extensive quantitative analysis.

Table 1. List of schools, subjects and teachers involved in the FlipEd: Holistic School Support programme

SCHOOLS	SUBJECTS	NO. OF TEACHERS
School A (Chinese Vernacular Primary School)	English Language	2
School B (Tamil Vernacular Primary School)	Tamil Language	2
School C (National Primary School)	Mathematics	2
School D (National Primary School)	Science	2

Instruments

The instruments for this study were Edpuzzle quizzes and field notes. During Workshop 1, teachers were required to take two quizzes on flipped classrooms. These quizzes were presented in an interactive format via Edpuzzle, each comprising 12 multiple-choice and one open-ended question. The quizzes were designed to check teachers' understanding of the concept of a flipped classroom. The results of the completed quizzes were saved as MS Excel files for data analysis.

Teachers and pupils were observed in a classroom showcase session and documented by utilising field notes. The observation aimed to assess engagement levels, instructional strategies, and pupil responses to the flipped classroom model. Field notes were utilised to document these observations. Each observation session lasted approximately one hour, providing a comprehensive view of the classroom dynamics and interaction. Silverman (2008) mentioned that text and documentation are not only produced, but also, in turn, are productive. The field notes described classroom activities and produced reflective information about the individuals being studied. McMillan (2008) argues that field notes

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usually contain descriptions of activities in which people were involved and reflective comments of the researcher.

The criteria for assessing a flipped classroom in-class session are integral to fostering an effective and engaging learning environment. Preparation ensures pupils acquire foundational knowledge, enhancing their readiness for in-depth class activities (Bergmann & Sams, 2012). Engagement and collaboration promote active learning and teamwork, which are essential for cognitive and social development. Applying knowledge to in-class tasks demonstrates mastery and practical understanding, while critical thinking reflects higher-order cognitive skills. Instructor interaction provides personalized support, and feedback utilisation encourages continuous improvement. Finally, completing activities measures accountability and effective use of class time, ensuring pupils actively participate and apply their learning. These criteria collectively support the flipped classroom model's goal of creating a dynamic, pupil-centred learning experience.

Based on the flipped classroom approach, videos are mainly used to deliver the subject content. Teachers in this study were required to produce before-class video content by utilising the Edpuzzle application. The teachers' pre-class videos were analysed using a rubric to utilise Edpuzzle as a digital tool for flipped classroom purposes. Teachers were observed during the classroom showcase. Researchers utilised field notes to record the entire lessons for qualitative data analysis. The concept of flipped classroom and the use of digital tools were the main underpinning elements of the observations.

Procedures

The programme involved 3 workshops and 2 mentoring sessions as shown in Table 2 below.

Table 2. FlipEd: Holistic School Support programme

WORKSHOP 1	WORKSHOP 2	WORKSHOP 3	MENTORING 1	MENTORING 2
Introduction	Exploration	Production	Implementation	Reflection

Workshop 1

The workshop introduced the teachers to the concept of flipped classrooms. They were given the perspective of reversing the traditional instruction sequence and the idea of teaching contents to be delivered at home via videos and classroom time to be used as the platform for higher order thinking skills (HOTS) to be actively involved for pupils to have meaningful learning experiences. They should also see how the teacher's role as a facilitator is 'a guide by the side'.

Workshop 2

Teachers attended the second workshop to explore a digital tool called Edpuzzle. The digital tool helped teachers transform an informative video into an interactive form where pupils' progress was recorded. Teachers were given the idea of how Edpuzzle can assist pupils in preparing for pre-class video watching.

Workshop 3

The session allowed teachers to produce pre-class videos for their respective subjects. The teachers explored Edpuzzle features such as video cutting, question types (open-ended, multiple-choice, note), managing the Edpuzzle video quiz by assigning videos, and monitoring pupils progress via grade book. Teachers utilised video sources from YouTube and other video hosting sources. At the end of the session, they produced interactive videos for pre-class content.

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Mentoring 1
Teachers received post-workshop support via mentoring sessions to help them utilise the pre-class video they produced for flipped classrooms. Based on their products, two teachers from each school were selected to carry out pre-class videos, which they have refined.

Mentoring 2
In this session, the selected teachers met with the programme instructors for guidance on implementing flipped classrooms. Teachers received assistance in planning for flipped classroom sessions. Following this planning phase, teachers will implement the flipped classrooms in their respective schools, applying the strategies and techniques discussed. After the implementation phase, there will be a feedback and evaluation phase. During this period, teachers were assessed for the effectiveness of the flipped classroom approach and offered additional assistance as needed.

Data analysis
Quantitative data was analysed by reporting the distribution of correct and wrong answers from the comprehension questions. The questions were divided into four categories: Classroom Practice (CP), Pupil-centred (SC), and Pre-class Content Delivery (PREC). To ensure the validity of the questions, a pilot study was conducted with a sample of participants like the target population. Feedback from this pilot study was used to refine the questions, ensuring they accurately measured the intended constructs. Additionally, content validity was established through expert review, where subject matter experts evaluated the questions for relevance and clarity. Qualitative data was collected by making inferences about documentation and observations during workshops and flipped classroom implementation. The open-ended question on teachers' understanding of their role in flipped classrooms was analysed via CAQDAS software QDA Minor Lite. Silverman (2008) mentioned that text and documentation are not only produced, but also, in turn, are productive. Saldaña (2015) noted that thinking inferentially is critical for qualitative researchers, particularly during participant observation and document and artefact reviews. In describing face-to-face interaction abilities to provide data in qualitative studies, it is mentioned that analysis is directed towards developing observations that characterise aspects of the Indigenous reasoning and practices that participants use in the production and intelligibility of particular social actions and activities (Silverman, 2008).

RESULTS AND DISCUSSION

Results

RQ1: To what extent do teachers understand the flipped classroom concept?

Teachers' understanding was assessed through the flipped classroom quizzes they completed. In Workshop 1, teachers were introduced to the concept of flipped classrooms, which focused on pupil-centered learning, classroom practice, and delivering content before class. The different elements of comprehension were categorized and presented in Table 3:

Table 3. Questions of the flipped classroom quiz

CATEGORIES	QUESTION TYPE	NO. OF QUESTIONS
Classroom Practice (CP)	Multiple-choice	6
Pupil-centred (SC)	Multiple-choice	4
Pre-class Content Delivery (PREC)	Multiple-choice	3
Pre-class Content Delivery (PREC) - Qualitative	Open-ended	1
TOTAL		**14**

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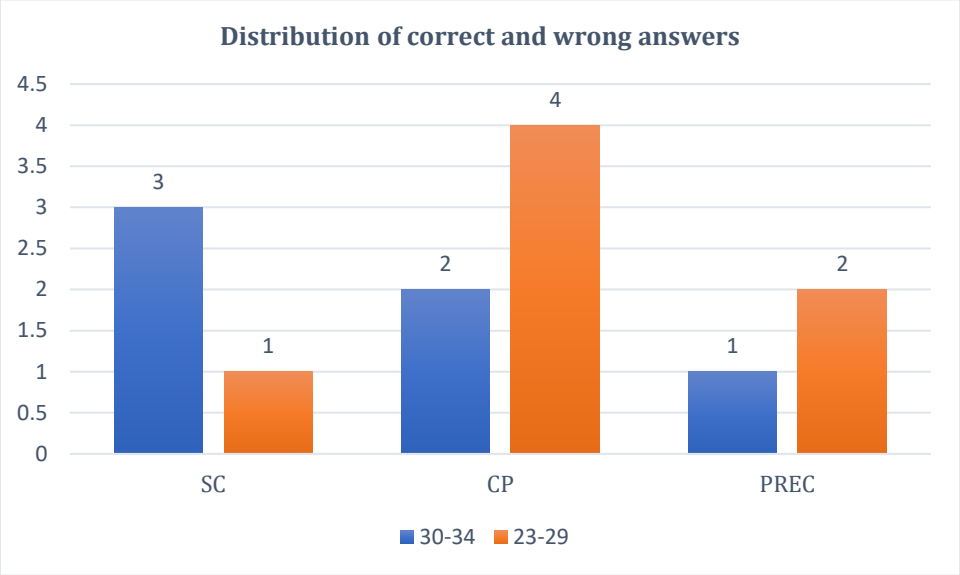

Figure 1. Distribution of correct and wrong answers

The item analysis in Figure 1 reveals that teachers understood the Pupil-Centred (SC) concept of the flipped classroom well, with three questions in this category receiving more than 30 correct answers. However, one question within the same category fell below this threshold, with fewer than 30 correct responses.

In contrast, the Classroom Practice (CP) category demonstrated lower levels of understanding. Here, four questions garnered fewer than 30 correct answers, while only two questions achieved more than 30 correct responses. Similarly, the Pre-class Content Delivery (PREC) category also indicated low comprehension. Two questions received fewer than 30 correct answers, and only one question surpassed the 30 correct answer mark.

In summary, while teachers showed a relatively good grasp of the pupil-centred concept in the flipped classroom model, significant challenges were evident in understanding Classroom Practice and Pre-class Content Delivery. These findings highlight critical areas for enhancement in teaching and learning strategies.

Based on responses to an open-ended question, the qualitative data reveals a nuanced understanding among teachers regarding their roles within the flipped classroom model. This analysis has uncovered several key themes that illustrate teachers' awareness of their multifaceted responsibilities as shown in Table 4. Below are the descriptions of the types of teachers' awareness:

Awareness of facilitator role

Teachers consistently demonstrated an understanding of their role as facilitators. They recognize that in a flipped classroom, their primary function shifts from being the central source of information to guiding and supporting pupils' learning processes. This facilitative approach encourages pupils to engage actively with the material and with each other, fostering a more collaborative and interactive learning environment.

Functioning as motivators

Another prominent theme is teachers' awareness of their role as motivators. Teachers expressed a clear understanding of the importance of inspiring and encouraging pupils. They recognize that their enthusiasm and support are crucial in maintaining pupil

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engagement and motivation, particularly in a flipped classroom setting where pupils take on more responsibility for their learning outside traditional classroom hours.

Role as designers

Teachers also acknowledged their role as instructional designers. They are aware that effective flipped classroom implementation requires careful planning and designing of learning activities and materials. Teachers must create engaging pre-class content that prepares pupils for active participation in class. This involves a strategic approach to designing lessons that are both informative and stimulating, ensuring that pupils can maximize their learning during in-class activities.

Acting as guardians

The theme of teachers as guardians emerged, highlighting their responsibility in monitoring, and supporting pupils' progress. Teachers are aware of the need to provide a safe and supportive learning environment, where pupils feel comfortable taking risks and exploring new ideas. This guardian role involves not only academic support but also emotional and social guidance, ensuring that pupils remain focused and confident in their learning journey.

Pupils as active learners

In contrast to the traditional teacher-centred approach, the qualitative analysis revealed that teachers are aware of the necessity for pupils to be active learners in the flipped classroom model. Teachers recognize that pupils must engage with pre-class materials and participate actively in in-class discussions and activities. This shift empowers pupils to take ownership of their learning, develop critical thinking skills, and become more independent learners.

In summary, the qualitative findings indicate that teachers comprehensively understand their evolving roles in the flipped classroom model. They see themselves as facilitators, motivators, designers, and guardians, all crucial in supporting pupils as active learners. These insights underscore the importance of ongoing professional development and support for teachers to embrace and implement the flipped classroom approach effectively.

Table 4. Key themes

THEMES	SAMPLE OF DATA EXCERPTS
Awareness of Facilitator Role	*"During class time, I would then become a facilitator; guiding pupils through active learning activities such as group discussions; problem-solving exercises; and hands-on projects"*
Functioning as Motivators	*"This shift enables me to provide targeted support; answer questions; and address misconceptions; fostering a deeper understanding of the material while encouraging critical thinking and collaboration among my pupils."*
Role as Designers	*"I would create pre-recorded lectures or instructional materials that pupils can access outside of class; allowing them to acquire foundational knowledge independently."*
Acting as Guardians	*"I can guide the pupils if they ever come across questions that are tricky and might need further explanation."*
Pupils as Active Learners	*"creating more space and engaging sessions with each playing a role in the learning process emphasis more on the targeted pupils who need help and guidance."*

RQ2: How do teachers implement technology-integrated flipped classrooms?

The observations across the four teachers reveal varying degrees of utilisation of digital tools, creativity in lesson planning, and application of higher order thinking skills. All teachers employed Edpuzzle for before-class activities, but they still need to fully utilise its note feature, which could have provided better guidance and enhanced pupil engagement.

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School 1 Teachers demonstrated creativity by producing their instructional videos but relied heavily on comprehension-based activities during class. School 2 Teachers focused on reinforcing understanding through discussions and quizzes, with limited emphasis on creative lesson planning. School 3 Teachers' mathematics lesson involved hands-on activities like drawing and labelling, reflecting the "applying" level of Bloom's Revised Taxonomy, but lacked more complex, creative tasks. School 4 Teachers' science lesson provided essential content on photosynthesis with minimal engaging features and limited activities promoting higher-order thinking. Overall, while digital tools were adequate, there is significant room for improvement in utilising all available features. Additionally, enhancing lesson creativity and designing activities that foster higher order thinking skills such as analysing, evaluating, and creating will contribute to more dynamic and compelling learning experiences.

Discussions

The quantitative and qualitative findings comprehensively picture flipped classroom implementation among the observed teachers. Quantitatively, it is evident that while the teachers relatively well understand the pupil-centred (SC) concept of the flipped classroom, there still need to be significant gaps in their understanding of classroom practice (CP) and pre-class content delivery (PREC). Specifically, the item analysis revealed that most teachers correctly answered questions about the SC concept, indicating a sound theoretical grasp. However, the lower number of correct responses in the CP and PREC categories suggests that teachers need help with the practical and procedural aspects of the flipped classroom model.

Qualitatively, the open-ended responses provided more profound insights into the teachers' perceptions of their roles within the flipped classroom framework. Teachers see themselves as facilitators, motivators, designers, and guardians, reflecting a comprehensive understanding of their evolving roles. This self-perception is crucial for supporting pupils as active learners and aligns with the goals of the flipped classroom model. Nevertheless, the qualitative data from classroom observations indicate varied levels of effectiveness in implementing these roles practically.

Teachers universally employ Edpuzzle for pre-class activities, yet they still need to fully utilise its features, such as the note function, which could significantly enhance pupil guidance and engagement. School 1 teachers showed creativity in producing original instructional videos but relied heavily on comprehension activities during class, needing more opportunities to engage pupils in higher-order thinking. School 2 teachers' focus on reinforcing understanding through discussions and quizzes also needed more creative lesson planning. School 3 teachers' mathematics lessons involved hands-on activities that demonstrated application-level thinking but did not extend to more complex or creative tasks. Similarly, School 4 Teachers' science lesson provided foundational content without engaging features or higher order thinking activities.

These findings underscore a critical need for enhanced professional development focused on practical implementation strategies. While theoretical understanding of pupil-centred learning is solid, teachers require more support in translating this into effective classroom practice and content delivery. The partial use of digital tools suggests that teachers might benefit from targeted training on leveraging technology fully to enhance engagement and learning outcomes. This emphasis on continuous learning and professional development is not just a necessity but also a reassurance of our commitment to supporting educators in their journey towards effective flipped classroom implementation.

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Professional development is critical for teachers to remain effective in their ever-evolving roles. As education systems and student needs change, teachers must stay updated with the latest teaching methodologies, technological advancements, and pedagogical strategies. Comprehensive professional development programs can significantly enhance teachers' ability to deliver high-quality education. Such programmes should encompass a variety of features, including workshops, seminars, peer collaborations, and hands-on training sessions. By utilising all these features, teachers can gain a holistic understanding of new concepts and practical applications, thereby increasing their efficacy in the classroom.

Moreover, professional development should be ongoing rather than a one-time event. Continuous learning opportunities allow teachers to refine their skills and adapt to new challenges as they arise. For example, integrating technology into the classroom has become essential, and teachers need continuous training to use digital tools and platforms effectively. Additionally, programmes focusing on specific areas such as classroom management, student engagement, and differentiated instruction can address individual teacher needs, making the development process more tailored and impactful.

Finally, the success of professional development programmes is not solely dependent on the teachers but significantly on the support provided by educational institutions. Schools and districts should facilitate and actively create an environment that encourages and values continuous learning. This includes allocating time for professional development, providing access to resources, and fostering a culture of collaboration among teachers. When educators are supported and empowered to grow professionally, they are better equipped to inspire and educate their students, ultimately leading to improved student outcomes and a more robust educational system. This institutional support is a testament to the value and importance of teachers, making them feel supported and encouraged in their professional growth.

CONCLUSION

In conclusion, with its promising understanding of the pupil-centred concept, the flipped classroom model offers hope amidst the significant challenges in classroom practice and content delivery. However, more is needed to adopt this model. Addressing the gaps and challenges it presents requires ongoing professional development and support for creative lesson planning. These are essential for maximizing the potential of the flipped classroom model. By fostering higher-order thinking skills and enabling more dynamic learning experiences, teachers can better support their pupils' active and engaged learning, paving the way for a more effective and engaging educational experience. As educators continue to explore and refine these innovative methods, it is crucial to remember the importance of flexibility and adaptability in teaching approaches. The education landscape is ever-evolving, and staying attuned to the diverse needs of pupils will ensure that no one is left behind. Collaboration among educators, pupils, and parents will further enrich the learning environment, creating a community of support and shared growth. Moreover, by embracing a culture of continuous improvement and feedback, we recognise the invaluable role of educators in shaping the success of the flipped classroom model. Their insights and experiences will drive this iterative process, improving the model and advancing educational research and development in general. By collectively striving towards a future where every student has the opportunity to thrive, we can build a more inclusive, equitable, and effective educational system for all.

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AUTHOR CONTRIBUTION

Author 1 prepared research instruments, literature review, framework of the study and discussing of findings. Author 2 collected and analysed qualitative data, proofread, document formatting and interpreted the findings. Author 3 collected and analysed quantitative data as well as responding to reviewed documents for amendments.

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